

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SRI1P030.WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 02/ 06283	International filing date (day/month/year) 01/03/2002	(Earliest) Priority Date (day/month/year) 28/02/2002
Applicant SRI INTERNATIONAL		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

3a

☐ None of the figures.

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International application No.

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B x III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The present invention relates to mechanical-electrical power conversion systems. The systems comprise one or more electroactive polymers (513) that convert between electrical and mechanical energy. When a voltage is applied to electrodes (510, 512) contacting an electroactive polymer, the polymer deflects. This deflection (509) may be converted into rotation (514) of a power shaft included in a motor. Some motors of the present invention use a clutch. The clutch allows engagement and disengagement between a driving member (an electroactive polymer transducer) and a driven member (a power shaft). Repeated deflection of the polymer may then produce continuous rotation of the power shaft.

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H02N2/10 H01L41/09 H01L41/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L H02N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 194 815 B1 (CARROLL CHARLES B) 27 February 2001 (2001-02-27)	1, 11, 12, 25, 31, 37
Y	column 3, line 40 - line 65 column 14, line 29 - line 50 column 6, line 16 - column 9, line 67 ---	31
X	US 5 761 782 A (SAGER FRANK EVERETT) 9 June 1998 (1998-06-09)	54
A	column 12, line 41 - line 61; figure 14 --- -/--	81

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

4 July 2003

Date of mailing of the international search report

17/07/2003

Name and mailing address of the ISA

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KORNBLUH R ET AL: "Electrostrictive polymer artificial muscle actuators" , ROBOTICS AND AUTOMATION, 1998. PROCEEDINGS. 1998 IEEE INTERNATIONAL CONFERENCE ON LEUVEN, BELGIUM 16-20 MAY 1998, NEW YORK, NY, USA, IEEE, US, PAGE(S) 2147-2154 XP010281583 ISBN: 0-7803-4300-X	54-58, 60,61,64
Y	page 2153; figure 7 ---	65-69,74
X	WO 01 06579 A (STANFORD RES INST INT) 25 January 2001 (2001-01-25)	85-90
Y	page 22, line 33 -page 24, line 18 page 15, line 25 - line 33; figures 2A-2C page 20, line 28 -page 21, line 12; figure 2J ---	31,81-84
X	US 6 069 420 A (MIZZI JOHN V ET AL) 30 May 2000 (2000-05-30)	54,75
Y	column 15, line 32 -column 15, line 5 ---	65-69, 74,81-84
P,X	WO 01 58973 A (STANFORD RES INST INT; KORNBLUH ROY D (US); ECKERLE JOSEPH STEPHEN) 16 August 2001 (2001-08-16) page 5, line 25 -page 6, line 13 page 24, line 22 - line 31 column 27, line 9 -column 28, line 21 figures 3A,3B page 20, line 29 -page 21, line 24 figures 2B,2C -----	1,5-9, 16-20, 30,31, 37,39, 40, 85-88,90

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International application No.
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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

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Information on patent family members

International Application No

PCT/US 02/06283

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6194815	B1	27-02-2001	NONE	
US 5761782	A	09-06-1998	US 5798600 A	25-08-1998
			US 5892314 A	06-04-1999
			US 5889354 A	30-03-1999
WO 0106579	A	25-01-2001	AU 6230800 A	05-02-2001
			AU 7052000 A	05-02-2001
			EP 1212800 A1	12-06-2002
			EP 1221180 A2	10-07-2002
			JP 2003505865 T	12-02-2003
			JP 2003506858 T	18-02-2003
			WO 0106579 A2	25-01-2001
			WO 0106575 A1	25-01-2001
			US 6376971 B1	23-04-2002
			US 6543110 B1	08-04-2003
			US 6545384 B1	08-04-2003
			US 2002050769 A1	02-05-2002
			AU 4905801 A	20-08-2001
			AU 5288301 A	20-08-2001
			WO 0158973 A2	16-08-2001
			WO 0159852 A2	16-08-2001
			US 2001026165 A1	04-10-2001
			US 2002008445 A1	24-01-2002
US 6069420	A	30-05-2000	US 5770913 A	23-06-1998
			AU 3756299 A	08-11-1999
			CA 2328887 A1	28-10-1999
			WO 9954988 A1	28-10-1999
WO 0158973	A	16-08-2001	US 2002008445 A1	24-01-2002
			AU 4905801 A	20-08-2001
			AU 5288301 A	20-08-2001
			AU 6230800 A	05-02-2001
			AU 7052000 A	05-02-2001
			EP 1212800 A1	12-06-2002
			EP 1221180 A2	10-07-2002
			JP 2003505865 T	12-02-2003
			JP 2003506858 T	18-02-2003
			WO 0106579 A2	25-01-2001
			WO 0106575 A1	25-01-2001
			WO 0158973 A2	16-08-2001
			WO 0159852 A2	16-08-2001
			US 6376971 B1	23-04-2002
			US 6543110 B1	08-04-2003
			US 6545384 B1	08-04-2003
			US 2001026165 A1	04-10-2001
			US 2002050769 A1	02-05-2002

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-53

Mechanical/electrical power conversion system comprising electroactive polymer elements coupled to a crankshaft

2. Claims: 54-84

Mechanical/electrical power conversion system comprising electroactive polymer transducers and a clutch mechanism coupling the transducer to a power shaft

3. Claim : 85

Mechanical/electrical power conversion system comprising an electroactive polymer element and a flexure to improve torsional stiffness of the system